

## T10D11 – SL Organic Review

Name.....

1. Identify which of the compounds butane, chloroethane, propanone and propan-1-ol are  
(i) insoluble in water and give your reasoning.

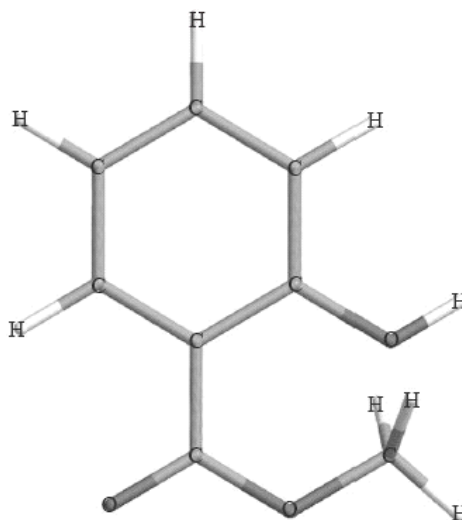
(2)

- (ii) water soluble and give your reasoning.

(2)

(Total 4 marks)

2. The following is a computer-generated representation of the molecule, methyl 2-hydroxy benzoate, better known as oil of wintergreen.



- (i) Deduce the empirical formula of methyl 2-hydroxy benzoate and draw the full structural formula, including any multiple bonds that may be present.  
The computer-generated representation shown does not distinguish between single and multiple bonds.

(2)

- (ii) In this representation, two of the carbon-oxygen bond lengths shown are 0.1424 nm and 0.1373 nm.  
Explain why these are different and predict the carbon-oxygen bond length in carbon dioxide.

(2)

- (iii) Name all the functional groups present in the molecule.

(2)

(Total 6 marks)

3. Methylbenzene,  $C_6H_5CH_3$ , reacts with  $Cl_2$  to form different products depending on the conditions used. For the gas-phase reaction of  $C_6H_5CH_3$  and  $Cl_2$  in ultraviolet light,  
(a) draw a structural formula for the product  $C_7H_7Cl$ .

(1)

- (b) provide a stepwise mechanism, clearly labeling each step.

(5)

- (c) explain the role of the ultraviolet light.

(1)

(Total 7 marks)

4. Ethene is an unsaturated hydrocarbon used as a starting material for many organic chemicals.

- (a) State the meaning of the term *unsaturated hydrocarbon*.

(1)

- (b) State an equation for the conversion of ethene to ethanol and identify the type of reaction.

(2)

- (c) Describe the complete oxidation of ethanol. Include the conditions, reagents required and any color changes. Name the organic product **X**.

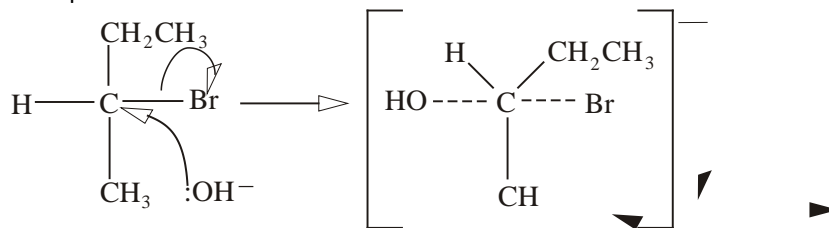
(4)

- (d) State an equation for the reaction between ethanol and compound **X**. Include any other reagent required. Name the organic compound **Z** and state **one** use of this product.

(4)

(Total 11 marks)

5. Secondary halogenoalkanes can undergo nucleophilic substitution reactions by both  $S_N1$  and  $S_N2$  mechanisms. The mechanism showing the formation of the transition state in the reaction between 2-bromobutane and potassium hydroxide can be represented as follows.



- (a) Identify the type of mechanism shown.

(1)  
3

- (b) State and explain how the following changes would alter the rate of the reaction by this mechanism.

(i) using water instead of potassium hydroxide.

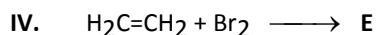
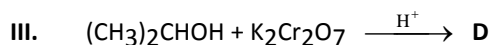
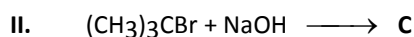
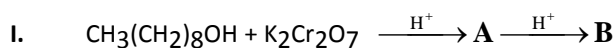
(2)

(ii) using bromoethane instead of 2-bromobutane.

(2)

(Total 5 marks)

6. (i) Identify the formulas of the organic products, A–E, formed in the reactions, I–IV:



(5)

- (ii)  $\text{H}_2\text{C}=\text{CH}_2$  can react to form a polymer. Name this **type** of polymer and draw the structural formula of a section of this polymer consisting of three repeating units.

(2)

(Total 7 marks)